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LEVER PRESSING IN EXPANDING OR COLLAPSING INTERVALS OF NONRESPONSE-CONTINGENT REWARD: SENSITIVITY TO PRETRAINING

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Summary.—16 rats that had been given either one or two training days of 50, response-contingent rewards per day were placed upon one of two schedules in which the daily interval between nonresponse-contingent rewards was either increased or decreased. In the expanding time condition, the fixed interval of nonresponse-contingent reward delivery changed from 10 sec. to 14 min. over 9 consecutive days while in the collapsing-time condition, the intervals were reduced from 14 min. to 10 sec. over the same duration. Whereas both one-day and two-day training groups in the collapsing-time condition and the two-day group in the expanding-time condition demonstrated typical extinction profiles, the one-day expanding-time group maintained significantly higher total responses over the entire period.

Numerous studies (1, 2, 3, 4) have demonstrated that different classes of animals repeat specific behaviors in the absence of contingent reinforcement. Frequently, the behaviors can be maintained for long periods of time if they had been or are coincident with noncontingent delivery of reward. In the present experiment, we examined the effect of different magnitudes of response-contingent training upon behaviours displayed within either increasing or decreasing intervals of nonresponse-contingent reward.

Sixteen 300- to 500-gm (100- to 140-days-old) male albino Wistar rats, obtained from Biobreeding Laboratories (Ottawa), were selected as subjects. In two separate experiments (8 rats/experiment) subjects were housed in single-animal cages and reduced to (over 5- to 10-day period) and maintained at 80% of their free-feed body weights. After two successive days of 15-min. exposures to one of two single-lever Lafayette operant-conditioning chambers, subjects were allocated to one of two continuous reinforcement (CRF) conditions. In Condition 1, the rats were allowed a total of 50 reinforcements (45-mg. Noyes food pellets) in one session while in Condition 2, rats were given two successive (daily) sessions of 50 reinforcements (a total of 100 reinforcements). Time required in each session to obtain the criterion number of reinforcements varied from 15 to 60 min.

Half the number of animals in each CRF condition were then allocated to either the expanding or the collapsing interval of nonresponse-contingent reward. For the expanding-time condition, the inter-reward interval for each of nine consecutive daily 30-min. sessions was increased in the following manner: 10 sec., 20 sec., 30 sec., 1 min., 2 min., 4 min., 7 min., 10 min., and 14 min. For the collapsing-time condition, reward intervals were reversed from 14 min. to 10 sec. over the 9-day period. Total responses emitted for each session by each animal were recorded by an event recorder.

Following each daily session, subjects were returned to the home cages and given preweighed Purina rat chow. In order to compensate for growth, a value of 3.3 gm/day was added to the *ad lib.* weight before the 80% value was calculated. Water was available *ad lib.* throughout the experiment. Three-way analyses of variance with

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one factor repeated (2 CRF conditions, 2 reward-intervals and 9 repeated measures) were completed by BMD software (BMD P2V) using a DEC System 2020. *Ad hoc* tests, means, standard deviations, and analyses of variance were also completed as checks by using the SPSS subprogram ONEWAY. Since tests for homogeneity of variance were significant between some main effects, square roots were taken for each score; this operation reduced the effects of the occasional outlier.

The means and the standard deviations for the total daily responses for the two main effects, temporal interval (expanding or collapsing) or CRF days (one or two) for the 9 consecutive sessions are shown in Fig. 1. A three-way analysis of variance with one factor repeated demonstrated a significant ($p = .001$) difference in responses between the two conditions of nonresponse-contingent reward ($F = 14.58$, $df = 1/12$). There was a marginally significant interaction between reward interval and CRF conditions ($F = 4.83$, $df = 1/12$, $p = .05$) and no significant main CRF effect ($F = 2.13$, $df = 1/12$, $p > .05$).

The repeated-measure analyses indicated a significant difference between the sessions ($F = 13.96$, $df = 8/96$, $p < .001$), with all groups combined and a significant interaction of repeated measure by reward interval ($F = 2.78$, $df = 8/96$, $p < .01$). All other interactions were not statistically significant. The same analysis with the square roots of the daily scores did not appreciably alter any of the significant measures. Neither covariance for body weights nor test order contributed in a statistically significant manner to the analyses.

The results of the present study clearly indicate that marginally acquired bar presses can be maintained for protracted periods of time when animals are placed within

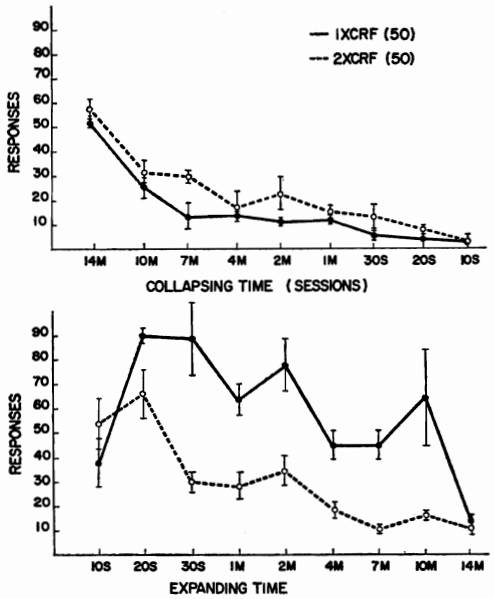

FIG. 1. Mean numbers of nonrewarded contingent responses displayed during schedules of collapsing or expanding times of delivery of reward for animals that had received either one or two days of CRF training (50 rewards)

situations where reward delivery is not dependent upon their behavior. The most clear result was the sensitivity of response maintenance within the expanding-time condition to the one versus two days of 50 response-contingent rewards during the training period. Although not necessarily surprising to the experienced researcher, it is interesting that such subtleties can maintain response rates when the reward interval is changing and is not contingent upon the animal's behavior.

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